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Nonlinear frequency shifts and harmonic generation in finite amplitude ion acoustic waves.

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We investigate analytically the effects of particle trapping on finite amplitude ion acoustic waves in mixed ion-species plasmas. Following Andreev and Tikhonchuk[1], we calculate the particle distribution functions in the presence of a periodic potential by solving the appropriate kinetic equation for a time long compared to the trapping time, but short compared to a collision time. The resulting distributions are flattened in the vicinity of the ion acoustic phase velocity and have trapped and untrapped components. Expressions for the perturbed charge density are obtained by integrating over velocity space and expanding in powers of $(e\phi/T)^{1/2}$. Substituting these in Poisson's equation gives an amplitude dependent dispersion relation and harmonic generation coefficients.
From this one can derive a candidate model for the saturation of SBS ion-acoustic waves.

(1) A. A. Andreev and V. T. Tikhonchuk, Sov. Phys. JETP, **68**, 1137 (1989)